Information Systems Development Support (ISDS) Contract
Contract Work Order (CWO) Implementation Plan

for

CWO 6 - Synthesizer Controller Software Development

Developed by
The ISDS Team
320 North Halstead, Suite 160
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Under Contract No. 960100
Control Number: WIP_06R1.DOC Rev 0
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for the

California Institute of Technology
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Foreword

Due to the timing of these Work Implementation Plans (WIPs) relative to (i.e., subsequent to) the start of the current DSN development efforts, a slightly different approach is being used than would normally be the case. WIPs document the planning that normally precedes development. The document then grows and is modified, if necessary, to reflect a dynamic development environment. Since much of the detail already exists for tasks already in progress at the beginning of the ISDS contract, the WIP references existing detail without significant elaboration. The WIP is envisioned as a central repository to pull together, by reference or inclusion, all the information available for a particular development task. The objective of this exercise is to provide all the information necessary to plan for, then to monitor and control the progress of each development task. This will be done with an eye on improving the total product and reducing redundancy and, thus, paper. Future WIPS will incorporate CASE and other development tools, when authorized, to reduce documentation costs and provide for the integration of the design and documentation processes into a single homogeneous (seamless) process. That is, documentation will be produced as a natural result of the planning, design and implementation process rather than as a separate activity.

Preface

This is the top-level CWO document used for defining and controlling the effort, organizational structure, management authority and responsibility, and resource allocations for the CWO. This is the baseline for continued enhancement and maintenance of the technical and management document developed under the guidelines set forth in DRD MA005 and in the ISDS Program Management Plan and is supported by the ISDS methodology.

The **order of precedence** is the ISDS contract and attachments, then the ISDS Project Management Plan and its supporting procedures, and then this plan. The ISDS Project Management Plan and supporting procedures can be explicitly waived with the concurrence of JPL and ISDS team management. Such actions and decisions are documented in Section 11, Deviations, Exceptions, and Waivers.

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1. INTRODUCTION

This is a software development task, already in progress, providing the Block V Synthesizer functionality specified in the ETX FRD and SYN Software Operators Manual.

1.1 Background

DSN is geographically distributed, complex, reliable, communication network. The DSCC Exciter-Transmitter Subsystem (ETX) is a part of the DSN Tracking System, Radio Science System, Command System and RF Physical System. The ETX consists of three major equipment groups: Exciter Group (EXC), Transmitter Group (TXG) and Controller Group (ETC) and performs the following functions:

- X and S-band RF uplink signal generation and amplification.
- Command and ranging of the uplink signal.
- Manual and automatic phase-continuous uplink tuning.
- RF filtering.
- Integrated subsystem monitor and control for reporting and fault isolation.

1.2 Purpose

The purpose of CWO 6 is to develop software which incorporates the required functionality for the Block V Synthesizer.

2. SOW & DELIVERABLES

2.1 SOW

Description of Work

The contractor shall develop controller software that will provide the Block V Synthesizer functionality specified in the ETX FRD and SYN Software Operators Manual (draft). The software will be written for the I960 Intel processor in C/C++ and assembly (as necessary).

2.2 Deliverables

2.2.1 CWO Specific Deliverables

A set of EPROMS containing the executable synthesizer software. Source code to be delivered via e-mail or floppy disk. Redlines are provided for update of the SOM and design documents. See attached schedule for delivery dates.

2.2.2 Deliverables Required by Contract or Derived from the CWO

See contract No. 960100 for specific data requirements of the CDRLs identified below.

1. MA005 - CWO Implementation Plan - draft, final, and updates as required

2. MA006 - Monthly Progress Report
3. MA007 - CWO Weekly Status and Major Problems Report

3. CWO DEVELOPMENT / IMPLEMENTATION APPROACH

3.1 CI Development

The code is developed on a DOS based PC compatible platform using cross compilers and assemblers from Microtec Research for the I960 Intel processor. The code is tested on the PC prior to delivery and integration by compiling and assembling using Microsoft Assembler and IBM C++ and executing the resultant code with a ETC simulator under OS/2.

3.2 Documentation

Redlines are provided for update of the SOM and design documents.

4. MANAGEMENT APPROACH

The management approach for this CWO is derived from and is consistent with the ISDS Program Management Plan. CWO specific items are limited to the WBS and the details of the CWO.

4.1 Subcontractors

4.1.1 Computer Sciences Corp. (CSC)

Infotec has retained CSC as its subcontractor for the ISDS contract. The terms and conditions of this subcontract are contained in Infotec's subcontractor agreement SK9503.

The ISDS Team which consists of Infotec and CSC operates as a virtual corporation with all direction and decisions residing with the Infotec PM. Technical direction of each CWO resides with the CWO manager regardless of company affiliation. CWO staffing is based on the best personnel able to meet the needs of the CWO without regard for company. JPL's interfaces with a single point of contact, the ISDS Team.

4.1.2 Affiliates/Consultants

Since this CWO is an extension of the effort under Telos CWO 55, Richard Curry (identified by JPL as key to effort) has been retained by the ISDS team as a consultant.

4.2 CWO Change Management

Change management for this CWO follows the process defined in the ISDS program Management Plan and in the Contract.

4.3 Tracking the Work

Schedules are given to all personnel working on the CWO. The schedule contains the individual's tasks and expected completion/milestone dates. In addition, all CWO personnel are given a Work Authorization Document (WAD) which contains valid time charge numbers correlated to the CWO tasks.

Weekly status reports are submitted by the CWO personnel to their CWO manager. These reports are used to update the CWO schedule contained in Microsoft Project and track CWO progress. CWO costs are collected and tracked in Microframe using CWO personnel timecard data and MIS data downloaded from corporate computers.

5. RISK MANAGEMENT PLAN

Risks specific to this CWO are presented in the following two tables. The first, Table 5-1, enumerates the high level risks associated with this CWO and with most CWOs. The second, Table 5-2, enumerates the critical risks, impact, and the technical and managerial mitigation strategies for this CWO.

Table 5-1 - High Level Risks for the CWO and How the ISDS Team Significantly Mitigates their impact on JPL

Type	Factor	CWO	Mitigation
known	Assumptions	Skill mix Technical Assumptions	Scope of CWO Scope of CWO
potential	Commitments	GFE availability and quality	Identify all, plan for it
	Technical / Management	Estimates & assumptions Interpretation of requirements Availability of key personnel	Interface with JPL to identify ahead of time Interface with JPL to identify ahead of time Skills are generally available in the job market
	Knowledge loss at CWO end	Inability to respond to problems or change requests	All work is documented and checked.
Unknown	--	Changing funding & priorities Changing requirements Key personnel attrition	All work is documented and checked. All work is documented and checked and necessary skills are generally available in the local job market

Table 5-2 CWO Requirements Risks, Impact, and Mitigation Strategies

Risk	Impact if Risk Realized	Mitigation
No critical risks identified	N/A	N/A

6. WORK BREAKDOWN STRUCTURE (WBS)

The CWO uses the standard ISDS WBS, modified to reflect the SOW.

7. ISDS WORK ORDER AUTHORIZATION

Name: Richard Curry (Consultant)	Company: IDI

Start Date: 12/28/94	End Date: 5/28/95
	Revision: 1

You are authorized to invoice these WBS numbers from start of business on the start date through close of business on the end date

ISDS WBS Number	Description of Work
313	**ICA SOW items 1, 2, and 3**: Demonstrate monitor and control of at least two synthesizer channels simultaneously. The two channels will both be maintaining a static frequency or ramping in sync. Demonstrate synthesizer accepts commands from ETC including set frequency and sending reports. Demonstrate with ETC and EXC full Doppler (phase) and frequency reporting to DMC and MDA. Demonstrate ability to perform multiple ramps on all four channels simultaneously.
383	**ICA SOW item 4:** documentation clean-up.
391	**ICA SOW item 4:** Support ETX integration testing.

8. CWO ORGANIZATION AND STAFFING

8.1 CWO Staff Names, Qualifications, & Availability

Since this CWO is an extension of the effort under Telos CWO 55, Richard Curry (identified by JPL as key to effort) has been retained by the ISDS team as a consultant and is available full time for the task duration.

8.2 CWO Organization

CWO task manager is Chad Nikoletich, who reports to the ISDS program manager, Kent Thomson.

8.2.1 CWO in the JPL Organization

This CWO supports Brent McWatters of section 333, Radio Frequency and Microwave Subsystems.

8.3 Staffing Profile

This is an LOE task for one person for the specified period. It has a constant one (1) FTE staffing profile.

8.4 Estimation Approach

This effort had been estimated and scheduled prior to takeover by the ISDS team.

9. CWO SCHEDULE AND DEPENDENCIES

9.1 Schedule

See attached schedule for this effort.

9.2 Dependencies

Dependencies are those items outside the control of the CWO manager. They are identified below to facilitate planning and management. Critical dependencies, if any, are included in the Risk Management Plan. The dependencies on this CWO are:

Mission constraints: The software executes on an embedded processor and is tested stand alone with a local power supply. The final configuration resides in a system which utilizes a central supply to power all devices. Potential power problems may impair operation of the synthesizer controller in the actual environment.

JPL facilities: None

JPL support: None.

User availability: None

Site personnel: None

GFE/GFI: None

10. GFE/GFI ITEMS

Microtec Research C++ cross compiler and cross assembler for i960 processor.

11. CLOSEOUT PLAN

This section will be provided 30 days prior to CWO end.

12. DEVIATIONS, WAIVERS, & EXCEPTIONS

This CWO has no deviations to established standards and procedures.